## REMARKS

A Petition for a Two-Month Extension of Time is being filed concurrently herewith.

Claims 1-34 are currently pending in the present application, with claims 13-22 having previously been withdrawn from consideration. Claims 1-12 and 23-34 have been rejected. Claims 1-7, 11, 12, 23-29, 33 and 34 have been amended. Applicants respectfully request reconsideration of the outstanding rejections based upon the foregoing amendments and following remarks.

The drawings have been objected to under 37 CFR 1.83(a) as failing to show every feature of the recited invention. Specifically, the drawings are alleged to not show the second and third air vents as originally recited. The claims have been amended to no longer recite second and third air vents.

The drawings have further been objected to under 37 CFR 1.84(p)(5) as failing to include the reference sign "8". Applicants respectfully traverse the objection and point out to the Examiner that the reference sign "8" is clearly shown in Figs. 1 and 5.

The Abstract has been objected to and the Office action has requested that the third and fourth occurrence of the term "a" on line 2 should be changed to "an". Applicants have rewritten the Abstract to make that change.

The specification has been objected to for stating throughout the text "show in Figs" without specifying a specific figure. The specification has been amended on pages 6 and 10-12 to add a specific figure to the phrase at issue. No new matter has been added through the amendments.

The Title has been objected to as not being descriptive. Applicants have rewritten the Title.

The claims have been objected to for failing to use the proper article "a" or "an", and in claim 3, line 2, a comma should follow the term "element". Claims 1-3, 7, 24, 25 and 29 have been amended to correct the perceived deficiencies objected to in the Office action.

Claims 4-6, 12, 26-28 and 34 stand rejected under 35 U.S.C. §112, first and second paragraph. The rejection based on the first paragraph is for containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time of filing of the application. The rejections under the second paragraph are for (a) containing subject matter not described in the specification in such a way to enable one skilled in the art to which it pertains to make and/or use the invention, and for (b) being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the original specification fails to disclose the second and third air vents recited in claims 4-6, 12, 26-28 and 34. Further, in claim 6 (and presumably claim 28 although not indicated as so in the Office action), it is allegedly unclear what structure is referred to by the term "1:10". Finally, in claim 11 (and presumably claim 33 although not indicated as so in the Office action), it is allegedly not clear what and where the outer wall is.

Claims 4-6, 12, 26-28 and 34 have been amended to remove any recitation of second and third air vents. Instead, claims 4-6 and 26-28 recite "an air vent located

upstream from said flow measuring element". Further, claims 12 and 34 have been amended to recite "an air vent positioned at the base of said inclination". The air vent as recited in claims 4-6, 12, 26-28 and 34 can be seen in Fig. 8 at reference number "11". Additionally, claims 6 and 28 have been amended to recite "a ratio of an opening surface area of said air vent to a sectional surface area of said sub-passage is less than about 1:10" to further clarify the ratio. Finally, claims 11 and 33 have been amended to recite "said sub-passage further comprises an outer wall and an inclination of the outer wall". With the amendment of claims 4-6, 11, 12, 26-28, 33 and 34, the claims should now be in full compliance with the requirements of §112, first and second paragraphs.

Claims 1-8, 10-12, 23-30 and 32-34 stand rejected under 35 U.S.C. §103 as being unpatentable over JP 11-248505 in view of Thurston et al.

Independent claims 1 and 23 each recite an air flow measuring device that includes, among other things, "a sub-passage ... having a predefined curvature with a maximum downstream point" and "a flow measuring element located in said sub-passage ... wherein said sub-passage has a successive curvature between said point and said flow measuring element". The presence of the successive curvature reduces the collisions between dust and other particles entering the sub-passage and the flow measuring element.

Neither JP 11-248505 or Thurston, taken alone or in combination, teaches or suggests "a successive curvature" of the sub-passage between the maximum downstream point and the flow measuring element. The absence of "a successive curvature" as recited allows for collisions between dust and other particles entering the sub-passage and the flow measuring element.

Claims 9 and 31 stand rejected under 35 U.S.C. §103 as being unpatentable over JP 11-248505 in view of Thurston et al. and further in view of WO 99/53274. Claim 9 depends from claim 1 and claim 31 depends from claim 23.

WO 99/53274 is relied upon as disclosing a device located in an air intake passage of an internal combustion engine for the purpose of measuring the induction air mass of an internal combustion engine. WO 99/53274 adds nothing of significance with regard to "wherein said sub-passage has a successive curvature between said point and said flow measuring element" as recited in claims 1 and 23.

Applicants believe that each of the presently pending claims are in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

The Abstract has been replaced, the Title has been rewritten, various paragraphs have been replaced, and claims 1-7, 11, 12, 23-29, 33 and 34 have been rewritten as follows:





[redacted]

Replace Abstract:

## ABSTRACT

The present invention provides an air flow measuring device comprising a housing with a sub-passage having an inlet and an outlet for air flow formed in the housing, the sub-passage further having a predefined curvature with a maximum downstream point and a flow measuring element located in the sub-passage at a position at least further downstream from the point.

Rewrite Title:

AIR FLOW MEASURING DEVICE HAVING A CURVED SUB-PASSAGE

Replace paragraphs beginning at page 2, lines 9 and 14:

In an object of the present invention, an air flow measuring device comprising a housing with a sub-passage having an inlet and an outlet for air flow formed in the housing is provided. The sub-passage has a predefined curvature with a maximum downstream point. Also, a flow measuring element is located in the sub-passage at a position at least further downstream from the point.

In another object of the invention, an engine comprising an engine control unit and an air flow measuring device electrically coupled to the engine control unit for measuring air flow is provided. The air flow measuring device comprises a housing with a sub-passage having an inlet and an outlet for air flow [is] formed in the housing. The sub-passage has a predefined curvature with a maximum downstream point. Also, a flow measuring element is located in the sub-passage at a position at least further downstream from the point.

Replace paragraph beginning at page 5, line 13:

Referring now to drawings, Fig. 1 illustrates a cross-sectional view of an air flow measuring device of the present invention. The air flow measuring device is preferably a heating resistor type. In an air intake passage 1 of an automobile internal combustion engine, a module housing 2 for a heating resistor type air flow measuring device is installed through a module flange 5. A sub-passage 7 is formed at the end of the module housing 2 and a flow measuring element 3 is installed inside the sub-passage 7. The flow measuring element 3 is electrically connected with an electronic circuit 4 installed in the module housing 2 and the electronic circuit 4 is electrically connected with the outside through a connector 6. The sub-passage 7 contains a sub-passage inlet 9 whose opening face is perpendicular to the air flow into the air intake passage 1 and a sub-passage outlet 10 whose opening face is parallel to the air flow into the air intake passage 1. In other words, the direction of the air flow is inline with the inlet 9 and the air flow exits outlet 10 in a direction which is perpendicular to the entering air flow. Sub-passage 7 has a semi-circular bottom bend 8 with a predefined curved surface and the flow measuring element 3 is located on the downstream side of the bend of the sub-passage 7. Bottom bend 8 has a maximum downstream point 8a (shown in Fig. 1) at or near the apex of the curvature. Hence, air flow enters inlet 9 and travels in a direction upstream 8b (shown in Fig. 1) to the maximum downstream point 8a and travels in a direction downstream 8c (shown in Fig. 1) toward outlet 10. Hence, dust particles or other foreign matter which has entered sub-passage 7 travels along the outer wall surface 71 (as shown in Fig. 3) at the sub-passage bottom bend 8 by inertial force based on the velocity and weight of the dust particle or foreign matter. Thus, the dust particles or other foreign matter does not interfere with the

flow measuring element 3 located around the maximum downstream point 8a of the sub-passage bottom bend 8 and is discharged to the air intake passage 1 through the sub-passage outlet 10.

Replace paragraph beginning at page 10, line 11:

Fig. 7 illustrates a cross-sectional view of a modified version of the sub-passage structure as shown in Fig. 1. The sub-passage 7 has a sub-passage inlet 9 with an opening face which is perpendicular to the air flow in the air intake passage 1 and a sub-passage outlet 10 with an opening face parallel to the air flow in the air intake passage 1. Sub-passage 7 has a semi-circular bottom bend with a predefined curved surface and the flow measuring element 3 is located on the downstream side of the bend of the sub-passage 7. Bottom bend 8 has a maximum downstream point 8a (shown in Fig. 1) at or near the apex of the curvature. Hence, air flow enters inlet 9 and travels in a direction upstream 8b (shown in Fig. 1) to the maximum downstream point 8a and travels in a direction downstream 8c (shown in Fig. 1) toward outlet 10. Hence, since dust particles or other foreign matter which has entered sub-passage 7 travels along the outer wall surface 71 (as shown in Fig. 3) at the sub-passage bottom bend 8 by inertial force based on the velocity and weight of the dust particle or foreign matte, it does not interfere with the flow measuring element 3 located downstream from the maximum downstream point 8a of the sub-passage bottom bend 8 and is discharged to the air intake passage 1 through the sub-passage outlet 10.

Replace paragraphs beginning at page 11, line 18 and page 12, line 4:

Fig. 8 illustrates a cross-sectional view of a modified version of the sub-passage structure as shown in Fig. 1. Here, a second vertical path bottom inclination 12a (shown in Fig. 8) is provided opposite to that of the first inclination 12. The second inclination 12a is also provided upstream from the maximum downstream point 8a. This design is suited to sub-passages which have a first vertical path 73, smaller than the one described in Fig. 7.

Figs. 9 and 10 show other embodiments, as modified versions of the embodiment shown in Fig. 7. Note, in both these embodiments, the air flow measuring element 3 is also provided downstream from the maximum downstream point 8a (shown in Fig. 7). Also, in the embodiment as described in Fig. 10, a second horizontal path 76 is shown. These embodiments produce substantially the same effect on dust particles and other foreign matter entering the sub-passage 7 as the one described in Fig. 7.

Rewrite claims 1-7, 11, 12, 23-29, 33 and 34:

1. (Amended) An air flow measuring device comprising:

a housing;

a sub-passage with an inlet and an outlet for air flow formed in said housing, said sub-passage having a predefined curvature with a maximum downstream point; and

a flow measuring element located in said sub-passage at a position at least further downstream from said point, wherein said sub-passage has a successive curvature between said point and said flow measuring element.

2. (Amended) The device of claim 1 wherein said outlet has an opening face in a plane parallel to said air flow into said inlet.

3. (Amended) The device of claim 1 further comprising [a first] an air vent located downstream from said flow measuring element, said [first] air vent having an opening surface area of less than about fifty percent of a surface area of said outlet..

4. (Amended) The device of claim 1 further comprising [a second] an air vent located upstream from said flow measuring element.

5. (Amended) The device of claim 4 wherein said [second] air vent has a height of about 1 mm.

6. (Amended) The device of claim 4 wherein a ratio of an opening surface area of said [second] air vent [has an opening surface area ratio of less than about 1:10 compared] to a sectional surface area of said sub-passage is less than about 1:10.

7. (Amended) The device of claim 1 wherein said sub-passage further comprises an outer wall, said outer wall having a predefined groove for collecting unwanted matter in said air flow.

11. (Amended) The device of claim 9 wherein said sub-passage further comprises an outer wall and an inclination of the outer wall at least before said point.

12. (Amended) The device of claim 11 further comprising [a third] an air vent positioned at the base of said inclination.

23. (Amended) An air flow measuring device comprising:

a housing and a sub-passage formed in said housing, said sub-passage having a predefined curvature with a maximum downstream [point and] point, a flow measuring element located in said sub-passage at a position at least further downstream from said point, and a successive curvature between said point and said flow measuring element.

24. (Amended) The device of claim 23 wherein said sub-passage further comprises an inlet and an outlet for air flow, said outlet having an opening face in a plane parallel to said air flow into said inlet.

25. (Amended) The device of claim 24 further comprising [a first] an air vent located downstream from said flow measuring element, said [first] air vent having an opening surface area of less than about fifty percent of a surface area of said outlet.

26. (Amended) The device of claim 23 further comprising [a second] an air vent located upstream from said flow measuring element.

27. (Amended) The device of claim 26 wherein said [second] air vent has a height of about 1 mm.

28. (Amended) The device of claim 26 wherein a ratio of an opening surface area of said [second] air vent [has an opening surface area ratio of less than about 1:10 compared] to a sectional surface area of said sub-passage is less than about 1:10.

29. (Amended) The device of claim 23 wherein said sub-passage further comprises an outer wall, said outer wall having a predefined groove for collecting unwanted matter in said air flow.

33. (Amended) The device of claim 23 wherein said sub-passage further comprises an outer wall and an inclination of the outer wall at least before said point.

34. (Amended) The device of claim 33 further comprising [a third] an air vent positioned at the base of said inclination.